

## ROTARY MACHINE FOR DELIVERING LIQUIDS OR GASES

Patent Number: WO9427048  
Publication date: 1994-11-24  
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Requested Patent:  WO9427048  
Application: WO1994HU00013 19940510  
Priority Number(s): HU19930001340 19930510  
IPC Classification: F04B43/14; F04B43/12; F04B45/10  
EC Classification: F04B43/12G4, F04B43/14  
Equivalents: AU7008294, HU66329  
Cited Documents: US3684408; US4544329; DE573751; SU1208310

### Abstract

The invention relates to a rotary machine for delivering liquids or gases, the invention is a rotary machine for delivering liquids or gases comprising a driving unit (2) coupled with a rotating part (11), a housing (1) provided with suction and delivery openings (5, 7) and a stationary part (3) arranged in said housing (1). The machine according to the invention may be a pump or compressor and is very advantageous among others for pumping corrosive and erodent fluids or compressing gases, wherein, according to the invention, the rotating part (11) is provided with rolls (15) rotatably mounted on shafts (16) arranged radially with respect to the axis of rotation (6) of the machine, said stationary part is an elastic disc (3) provided with channels (8) within said disc (3) and with ribs (25) on the surface facing the rolls (15) along said channels (8), wherein each of the channels are including an angle with the respective radii (R) and one end thereof is connected to the suction opening (7), the other one to the pressure opening (5). The rolls (15) are of conical shape having a greater diameter radially outside than inside and are arranged in uniform distances from each other along a circle coaxial with the axis of rotation (6). The respective heights (h) of the ribs (25) are greater than that of the channels (8) in the same axial directions. The elastic discs (3) preferably consist of two parts (3a, 3b) in axial direction: a support part (3a) at the front wall of the housing and a pressed part (3b) facing the inside of the housing (1), the channels (8) being between these two parts (3a, 3b).

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International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : <b>F04B 43/14, 43/12, 45/10</b>		A1	(11) International Publication Number: <b>WO 94/27048</b> (43) International Publication Date: 24 November 1994 (24.11.94)
(21) International Application Number: <b>PCT/HU94/00013</b>		(81) Designated States: AU, BB, BG, BR, BY, CA, CN, CZ, FL, JP, KP, KR, KZ, LK, LV, MG, MN, MW, NO, NZ, PL, RO, RU, SD, SK, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG)	
(22) International Filing Date: 10 May 1994 (10.05.94)			
(30) Priority Data: P 9301340 10 May 1993 (10.05.93) HU			
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(54) Title: <b>ROTARY MACHINE FOR DELIVERING LIQUIDS OR GASES</b>			
(57) Abstract			
<p>The invention relates to a rotary machine for delivering liquids or gases, the invention is a rotary machine for delivering liquids or gases comprising a driving unit (2) coupled with a rotating part (11), a housing (1) provided with suction and delivery openings (5, 7) and a stationary part (3) arranged in said housing (1). The machine according to the invention may be a pump or compressor and is very advantageous among others for pumping corrosive and erosive fluids or compressing gases, wherein according to the invention, the rotating part (11) is provided with rolls (15) rotatably mounted on shafts (16) arranged radially with respect to the axis of rotation (6) of the machine, said stationary part is an elastic disc (3) provided with channels (8) within said disc (3) and with ribs (25) on the surface facing the rolls (15) along said channels (8), wherein each of the channels are including an angle with the respective radii (R) and one end thereof is connected to the suction opening (7), the other one to the pressure opening (5). The rolls (15) are of conical shape having a greater diameter radially outside than inside and are arranged in uniform distances from each other along a circle coaxial with the axis of rotation (6). The respective heights (h) of the ribs (25) are greater than that of the channels (8) in the same axial directions. The elastic discs (3) preferably consist of two parts (3a, 3b) in axial direction: a support part (3a) at the front wall of the housing and a pressed part (3b) facing the inside of the housing (1), the channels (8) being between these two parts (3a, 3b).</p>			

## ROTARY MACHINE FOR DELIVERING LIQUIDS OR GASES

5 The present invention relates to a rotary machine for delivering liquids or gases comprising a driving unit coupled with a rotating part, a housing provided with suction and delivery openings and a stationary part arranged in said housing.

10 Nowdays, turbine pumps, screw pumps, piston pumps and membrane pumps are generally used for delivering fluids.

15 Turbine pumps have a rather high delivery and piston pumps have rather high lift. At the same time, the turbine pumps have rather low lift and the piston pumps have rather small delivery. Accordingly, neither of these pumps has an advantageous performance characteristics for the practice.

20 On the other side, the membrane pumps have rather low lift as well as delivery and, at the same time have to be provided with rectification valves, and a mechanism for producing reciprocating motion which is rather disadvantageous with respect to the construction and the costs. Further disadvantage is the pulsating character of the delivery. Accordingly, membrane pumps are rarely used in the practice.

25 Screw pumps would be optimal for medium power and delivery requirements. This type of pumps is, however, rather complicated and expensive on the one hand, and has a rather high energy consumption, on the other hand. Furthermore, there are significant frictions within the pump, which would result in a relatively quick wearing.

30 It is also known a pump which comprises an elastic hose and rolls which are moving on said elastic hose in a way that closed sections within the hose deliver some fluid from one end of the hose to the other end thereof. The use of such types of pumps, however, is rather limited because of the low lift and delivery. Further disadvantage of that pump is the quick wearing of the hose which is pressed and released continuously.

35 Accordingly, the object of the present invention is to provide a self-priming rotary displacement machine (pump or compressor) of relatively simple construction and good performance characteristics which does not contain reciprocating parts or valves.

The angle between the channels and the radii is continuously changing along the channels, i.e. the channels are spiral ones.

5 The main point of the invention is therefore the elastic disc which is arranged between the front wall of the housing and the rolls of the rotating part, and comprises channels for delivering fluid from the suction opening to the pressure opening, due to the movement of the rolls which produces closed sections filled with fluid.

10 This structure and operation is not known in the field of pumps, so far. The way of operation resembles to the elastic hose pump which, however, has a low lift and delivery, meanwhile the machine according to the invention may be used for actually all purposes.

15 The invention is based on the recognition that an elastic disc provided with channels is rigid enough for producing rather high pressures and, at the same time, it is elastic enough to realize a delivery by producing closed sections. The rather high number of rotation enables a rather high delivery, meanwhile relatively low deformation is produced, which results in a relatively low load and long life time.

20 The machine is working without surface friction, which also increases the working life and reduces energie consumtions.

25 The rotating element comprising the rolls can work separated from the fluid delivered. Accordingly, lubrication may be ideal and no stuffing box is needed. All these parameters ensure a relatively high efficiency.

A proper choice of the materials for the housing and the disc enables to use the pump according to the invention for delivering chemicals as well as corrosive fluids.

30 The characteristic features of the machine are really advantageous in view of the application in the practice. These advantages are as follows:

- 35 • it is a rotary-type machine
- it is a displacement machine (the delivery is actually independent from the resistance)
- it can be applied both for gases and fluids and is it self-priming
- it is rather small and compact

are of conical shape the smaller ends facing the rotation axis 6. The outer surface of the carrier 9 and the inner wall are provided with high pitch thread 12 and stop elements (not shown). A spiral ring 17 is arranged between the crown 14 and a support cup 18.

5

The structure of the elastic disc 3 is shown in Figures 2 to 4.

Disc 3 is made of two parts 3a and 3b and these two parts are connected by ribs 19 and corresponding grooves 20 according to the embodiment in Figure 3. Channels 8 10 are generally defined by two opposite walls 21 and 22 of arcuate shape wherein the radius  $R_2$  of the arc at the front wall 1a of the housing is smaller than that of the opposite arc.

15 The connection between the two parts according to Figure 4 is produced by grooves 20a and 20b in the opposite parts and inserts 23 provided with extensions 24. Extensions 25 are arranged in a way that they reach channel 8 at the edges between the upper and lower walls 21, 22.

20 Elastic disc 3 is provided with ribs 25 on their surface facing the inner space of the housing 1. The height  $h_1$  of ribs 25 is preferably greater than the height  $h_2$  of the channels 8 in the corresponding axial direction.

25 The surface of the elastic disc 3 contacting the upper wall 1a of the housing 1 is preferably provided with grooves 26 at the sides of the channels 8.

25

The machine according to the invention operates as follows.

When driving unit 2 is started, shaft 10 rotates carrier 9, which in turn drives the part 30 11 of the pump. Due to the inertia of the rotating part 11, there is a slip between carrier 9 and the hub 13. Accordingly, the high pitch threads 12 move with respect to each other and force the rotating part 11 toward the elastic disc 3. In this way, rolls 15 are urged with optimum pressure to the elastic disc 3 throughout the operation. When the pump is out of operation, spring 17 exerts a slight pressure only, in order 35 to prevent static deformation of the elastic disc 3. On the other hand, the stops on the carrier 9 and the hub 13 limit the axial motion of the rotating part 11 and, accordingly, prevents to grow too high.

## Claims

1. Rotary machine for delivering liquids or gases, comprising a driving unit coupled with a rotating part, a housing provided with suction and delivery openings and a stationary part arranged in said housing **characterized in that** said rotating part (11) is provided with rolls (15) rotatably mounted on shafts (16) arranged radially with respect to the axis of rotation (6) of the machine, said stationary part being an elastic disc (3) provided with channels (8) within said disc (3) and ribs (25) on the surface facing the rolls (15) along said channels (8) wherein:
  - 10 • each of the channels (8) are including an angle ( $\alpha$ ) with the respective radii (R) and one end thereof is connected to the suction opening, the other one to the delivery opening (5),
  - the rolls (15) are of conical shape having a diameter greater radially outside than inside and are arranged in uniform distances from each other along a circle coaxial with the axis of rotation (6),
  - 15 • the respective heights (4) of the ribs (25) are greater than that of the channels (8) in the same axial directions.
2. Rotary machine as claimed in claim 1, **characterized in that** the elastic discs (3) preferably consists in axial direction of two parts: a supported part (3a) at the front wall (1a) of the housing (1) and a pressed part (3b) facing the inside of the housing (1), said channels (8) being between these two parts (3a, 3b).
3. Rotary machine as claimed in claim 2, **characterized in that** the opposite walls (21, 22) of the channels (8) defined by the parts (3a, 3b) of the disc (3) have arcuate shapes wherein radius ( $R_2$ ) of the arc at the housing (1) is smaller than that  $R_1$  of the other arc.
4. Rotary machine as claimed in claim 2 or 3, **characterized in that** the parts (3a, 3b) of the disc (3) are connected to each other by ribs (19) and grooves (20) on/in their opposite surfaces.
5. Rotary machine as claimed in claim 2 or 3, **characterized in that** the parts (3a, 3b) of the disc (3) are connected to each other by inserts (23) fitting into grooves (20a, 20b) in their opposite surfaces and having radial extensions (24) reaching the channels (8) by thin edges.

1/2

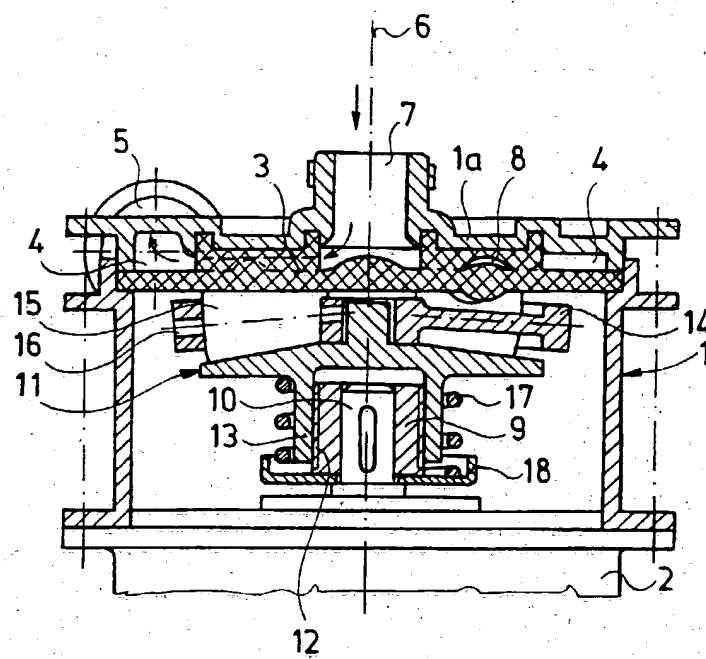


Fig. 1

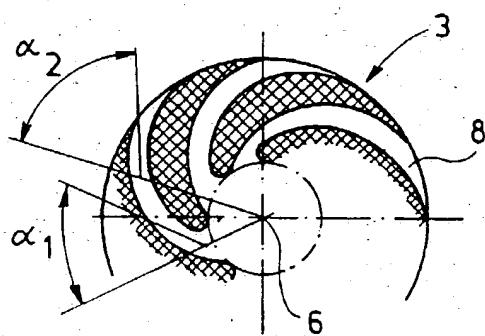


Fig. 2

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/HU 94/00013

## A. CLASSIFICATION OF SUBJECT MATTER

IPC<sup>5</sup>: F 04 B 43/14, 43/12, 45/10

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC<sup>5</sup>: F 04 B 43/00, 43/08, 43/12, 43/14, 45/08, 45/10; F 04 C 5/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPIL, IRIPAT, JAPIO, EPODOC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 3 684 408 (MACLIN) 15 August 1972 (15.08.72), totality; especially figs.2,3.	1-7
A	US, A, 4 544 329 (O'BOYLE) 01 October 1985 (01.10.85), totality.	1-7
A	DE, C, 573 751 (SICCAMETER) 16 March 1933 (16.03.33), totality.	1-7
A	Soviet Inventions Illustrated, section P,Q, week 8638, 29 October 1986 (29.10.86), Derwent Publications LTD London, Q 56; SU, A, 1 208 310 (SAPUNOV).	1-7

 Further documents are listed in the continuation of Box C. See patent family annex.

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## Date of the actual completion of the international search

12 September 1994 (12.09.94)

## Date of mailing of the international search report

20 September 1994 (20.09.94)

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